Camas Creek Subbasin Assessment and Total Maximum Daily Load

Department of Environmental Quality

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Abbreviations, Acronyms, and Symbols

§303(d)	Refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section
µ	micro, one-one thousandth
§	Section (usually a section of federal or state rules or statutes)
ADB	assessment database
AU	assessment unit
AWS	agricultural water supply
BLM	United States Bureau of Land Management
BMP	Best Management Practice
BOD	biochemical oxygen demand
BURP	Beneficial Use Reconnaissance Program
C	Celsius
CFR	Code of Federal Regulations (refers to citations in the federal administrative rules)
cfs	cubic feet per second
cfu	colony forming units
cm	centimeters
CWA	Clean Water Act
CWAL	cold water aquatic life
DEQ	Department of Environmental Quality
DO	dissolved oxygen
DWS	domestic water supply
EPA	United States Environmental Protection Agency
F	Fahrenheit
GIS	Geographical Information Systems
HUC	Hydrologic Unit Code
IDAPA	Refers to citations of Idaho administrative rules
IDFG	Idaho Department of Fish and Game
IDWR	Idaho Department of Water Resources
km	kilometer
km^2	square kilometer
kWh/day	kilowatt hours per day
LA	load allocation
LC	load capacity
m	meter
m^3	cubic meter
mi	mile
mi^2	square miles

mg/L milligrams per liter

mm millimeter

MOS margin of safety

n.a. not applicable

NA not assessed

NB natural background

NPDES National Pollutant Discharge Elimination System

NRCS Natural Resources Conservation Service

NTU nephlometric turbidity unit

PCR primary contact recreation

ppm part(s) per million

SBA subbasin assessment

SCR secondary contact recreation

SFI DEQ's stream fish index

SHI DEQ's stream habitat index

SMI DEQ's stream macroinvertebrate index

SS salmonid spawning

TIN total inorganic nitrogen

TMDL total maximum daily load

TP total phosphorus

TSS total suspended solids

t/yr tons per year

U.S. United States

U.S.C. United States Code

USDA United States Department of Agriculture

USFS United States Forest Service

USGS United States Geological Survey

WAG Watershed Advisory Group

WBAG *Waterbody Assessment Guidance*

WLA wasteload allocation

Executive Summary

The federal *Clean Water Act* (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. States and tribes, pursuant to Section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a *total maximum daily load* (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the Camas Creek Subbasin that have been placed on what is known as the "§303(d) list."

This subbasin assessment and TMDL analysis has been developed to comply with Idaho's TMDL schedule. This assessment describes the physical, biological, and cultural setting; water quality status; pollutant sources; and recent pollution control actions in the Camas Creek Subbasin located in south central Idaho. The first part of this document, the subbasin assessment, is an important first step in leading to the TMDL. The starting point for this assessment was Idaho's current §303(d) list of water quality limited water bodies. Twelve segments of the Camas Creek Subbasin were listed on this list. The subbasin assessment portion of this document examines the current status of §303(d) listed waters, and defines the extent of impairment and causes of water quality limitation throughout the subbasin. The loading analysis quantifies pollutant sources and allocates responsibility for load reductions needed to return listed waters to a condition of meeting water quality standards.

Subbasin at a Glance

The Camas Subbasin lies in south central Idaho (Figure 1). Camas Creek is the main water body that drains the subbasin. The headwaters of the creek originate in the flat Camas Prairie, flow through the Camas Prairie, and then discharge into Magic Reservoir. There are two ecoregions within the subbasin: the headwaters of the tributaries that feed into Camas Creek from the north originate in the Northern Rockies, while the remainder of the subbasin lies in the Snake River Plain/high deserts. Transitional zones exist between the two ecoregions.

TMDL AT A GLANCE

Subbasin :	Camas Creek Subbasin 17040220
Uses affected:	Cold Water Aquatic Life
	Salmonid Spawning
	Secondary Contact Recreation
Pollutants:	Temperature
	Sediment
	Nutrients
	Bacteria

Figure 1. Subbasin at a glance.

Hydrologically there is a great deal of activity occurring within the subbasin:

- Snow runoff events in the spring months feed the water bodies. These runoff events are large and rapid as the majority of the tributaries drain south facing slopes.
- Ground water is likely to play an important role in maintaining perennial flows, as the majority of the subbasin lies over the Camas Prairie aquifer.
- Water in the creek is more likely to continue as surface flow if water tables are higher and prevent the surface water from dissipating into the ground.
- The land uses of the subbasin require the diversion of water from their natural channels and in the past have led to the straightening of many channels.
- Many of the perennial water bodies in the subbasin have segments that act more as intermittent streams.

Hydrology is the most important factor contributing to impacts in the water bodies of the Camas Creek Subbasin.

The land of the subbasin is used in a number of ways by a number of entities:

- The largest land use coverage within the subbasin is rangeland followed by dry land agriculture.
- The largest land ownership coverage within the subbasin is private land followed by federally managed public lands.
- The largest vegetation coverage within the subbasin is shrub land followed by agricultural land.
- Most activity within the subbasin is nonpoint source activity.
- The City of Fairfield discharges its wastewater to a ditch that discharges to Soldier Creek.

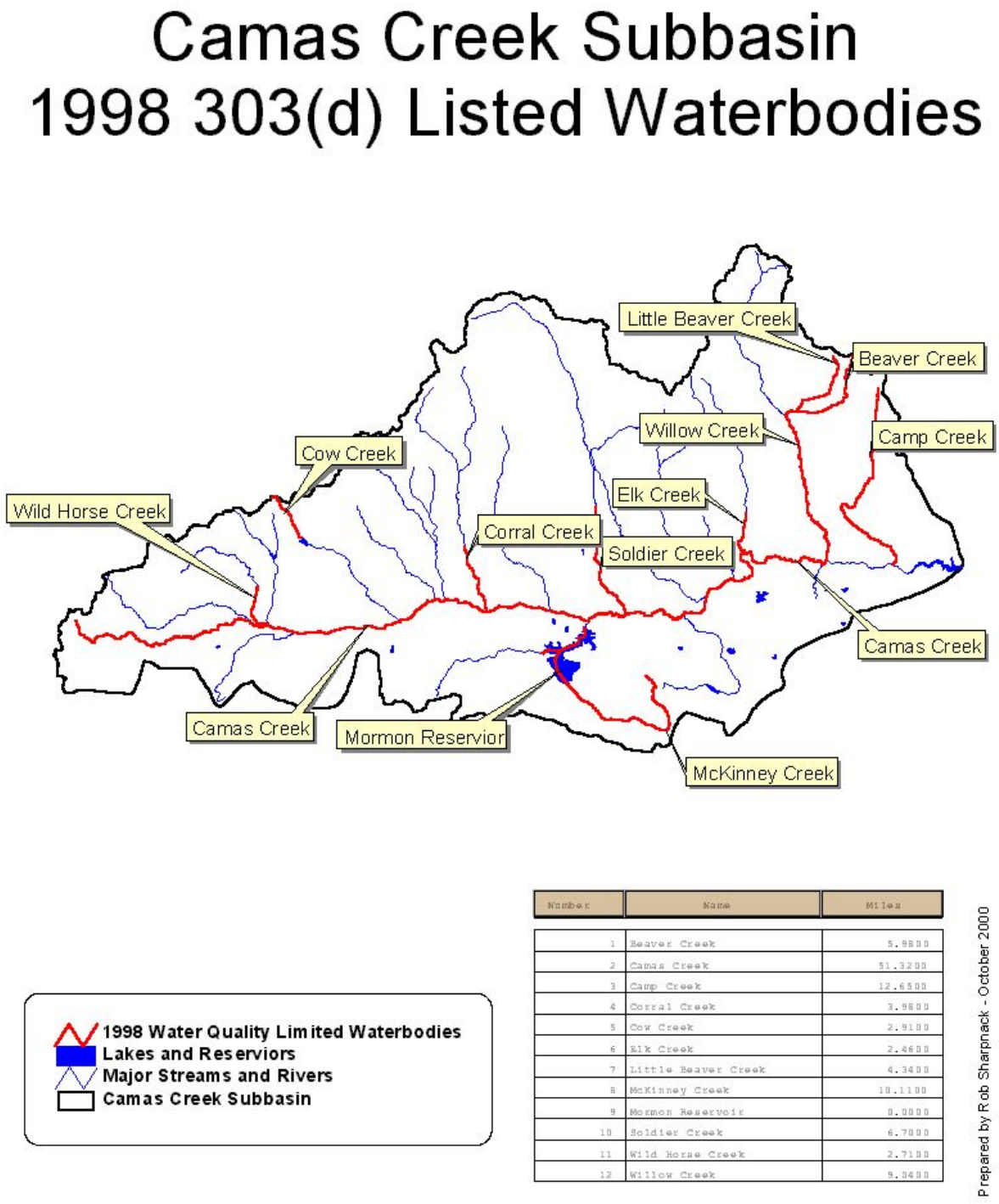
In 1998, twelve water body segments of the Camas Creek Subbasin were identified as being impaired (Table 1 and Figure 2). Many of these water bodies have been identified within the 1998 303(d) list as being impaired by unknown pollutants; a couple have been identified as being impaired by bacteria, dissolved oxygen, nutrients, sediment, and flow alteration. The beneficial uses that were being impacted by pollutants were cold water aquatic life, salmonid spawning, primary contact recreation, and secondary contact recreation.

Table 1. Impaired waters of the Camas Creek Subbasin.

Water body Name	Assessment Unit	1998 §303(d) Boundaries	Pollutants
Camas Creek	ID17040220SK013_05 ID17040220SK001_05 ID17040220SK007_05 ID17040220SK018_04 ID17040220SK018_03 ID17040220SK018_02	Headwaters to Macon Flat Bridge	SED
Soldier Creek	ID17040220SK011_02	Baseline to Camas Creek	BAC, DO, NUT, QALT, SED
Mormon Reservoir	ID17040220SK023L_0L		BAC, DO, NUT, QALT, SED
Little Beaver Creek	ID17040220SK004_02	Headwaters to Beaver Creek	UNKN
Camp Creek	ID17040220SK002_02 ID17040220SK002_03	Headwater to Camas Creek	UNKN
Willow Creek	ID17040220SK003_04	Beaver Creek to Camas Creek	UNKN
Elk Creek	ID17040220SK006_02	Baseline Road to Camas Creek	UNKN
McKinney Creek	ID17040220SK025_02	Headwaters to Mormon Reservoir	UNKN
Corral Creek	ID17040220SK015_03	Highway 20 to Camas Creek	UNKN
Cow Creek	ID17040220SK018_02	Headwaters to Cow Creek Reservoir	UNKN
Wild Horse Creek	ID17040220SK021_03	Highway 20 to Camas Creek	UNKN
Beaver Creek	ID17040220SK004_02	Headwaters to Willow Creek	UNKN

[a]Refers to a list, created in 1998, of water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303, subsection "d," of the Clean Water Act.
[b]SED-sediment, BAC-bacteria, DO-dissolved oxygen, NUT-nutrients, QALT-flow alteration, UNKN-unknown.

Through the subbasin assessment, it has been identified which pollutants are impacting the beneficial uses of the listed water bodies in the Camas Creek Subbasin. These findings will be discussed in the following section.



Number	Name	Miles
1	Beaver Creek	5.9800
2	Camas Creek	51.3200
3	Camp Creek	12.6500
4	Corral Creek	3.9800
5	Cow Creek	2.9100
6	Elk Creek	2.4600
7	Little Beaver Creek	4.3400
8	McKinney Creek	10.1100
9	Mormon Reservoir	0.0000
10	Soldier Creek	6.7000
11	Wild Horse Creek	2.7100
12	Willow Creek	9.0400

Figure 2. Impaired water bodies of the Camas Subbasin.

Key Findings

Data of various types were used to identify whether beneficial uses were fully supported in the 303(d) listed water bodies of the Camas Creek Subbasin:

- Biological data, including fish, macroinvertebrate, and habitat data.
- Water chemistry data, including pH, dissolved oxygen (DO), and turbidity
- Water chemistry data for nutrients, including total phosphorous (TP), total inorganic nitrogen (TIN), and chlorophyll.
- Water chemistry data and habitat data for sediment including total suspended solids (TSS), percent fines, and stream bank erosion inventories.
- Water chemistry data and habitat data for temperature including daily maximum and daily average temperatures and canopy cover.
- Water chemistry data for bacteria including *Escherichia coli* (*E. coli*) data.

These data were analyzed as described in Section 2 of this document and conclusions were drawn from the findings. Table 2 shows those water bodies requiring TMDLs. Table 2 summarizes the findings for each water body that was analyzed.

Table 2. Streams and pollutants for which TMDLs were developed.

Stream	Pollutant(s)
Camp Creek	Sediment , Temperature
Elk Creek	Sediment,
Soldier Creek	Sediment, Temperature
Corral Creek	Sediment, Temperature
Cow Creek	Sediment, Nutrients
Wild Horse Creek	Sediment, Bacteria, Temperature
Dairy Creek	Sediment, Nutrients
McKinney Creek	Sediment
Camas Creek	Sediment, Nutrients, Temperature
Mormon Reservoir	See Dairy and McKinney Creek

Table 3. Summary of assessment outcomes.

Water body Segment	Assessment Unit	Pollutant	TMDL Done	Recommended Changes to §303(d) List	Justification
Camas Creek	ID17040220SK013_05 ID17040220SK001_05 ID17040220SK007_05 ID17040220SK018_04 ID17040220SK018_03 ID17040220SK018_02	SED, TEMP, NUT	Yes	Add TEMP, NUT, and QALT,	Not meeting standards, delivery to storage system, channelization and diversion
Soldier Creek	ID17040220SK011_02	SED, TEMP	Yes	Remove DO, BACT, NUT Add TEMP	Meeting standards or criteria, Not meeting standards
Mormon Reservoir	ID17040220SK023L_0L	SED, TEMP	Yes	Remove BAC	Meeting standards
Little Beaver Creek	ID17040220SK004_02	TEMP	Yes	Add TEMP	Not meeting standards
Camp Creek	ID17040220SK002_02 ID17040220SK002_03	SED, TEMP	Yes	Remove UNK, Add SED, TEMP, QALT	Not meeting standards or criteria, channelization and storage
Willow Creek	ID17040220SK003_04	TEMP	Yes	Remove UNK, Add TEMP	Not meeting standards
Elk Creek	ID17040220SK006_02	SED	Yes	Remove UNK, Add SED	Not meeting criteria
McKinney Creek	ID17040220SK025_02	SED	Yes	Remove UNK, Add SED	Not meeting criteria
Corral Creek	ID17040220SK015_03	SED, TEMP	Yes	Remove UNK, Add SED, TEMP	Not meeting criteria or standards
Cow Creek	ID17040220SK018_02	SED, NUT	Yes	Remove UNK, Add SED, NUT	Delivering to storage system, not meeting criteria
Wild Horse Creek	ID17040220SK021_03	SED, BACT, TEMP	Yes	Remove UNK, Add SED, BACT, TEMP	Not meeting criteria or standards
Beaver Creek	ID17040220SK004_02	TEMP	Yes	Remove UNK, Add TEMP	Not meeting standards
Dairy Creek	ID17040220SK024_02	SED, NUT	Yes	Add SED, NUT	Delivering to storage system, not meeting criteria

[a]1998 303(d) refers to a list created in 1998 of water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303 subsection "d" of the Clean Water Act.
[b]AU- assessment unit (assessment unit prefix to values in table is Id17040221), SED- sediment, NUT- nutrient, BAC- bacteria, TEMP- temperature, DO- dissolved oxygen, QALT- flow alteration, UNK-Unknown.
[c]303(d) listed segments will remain the same; however TMDLs are completed on the entire length of the creek.

Total Maximum Daily Loads have been completed on all of the listed segments:

- Nutrient TMDLs have been completed on Cow Creek, Dairy Creek, and Camas Creek to aid in protecting water quality of the receiving reservoirs.
- Stream bank erosion TMDLs for sediment have been completed on Camp Creek, Elk Creek, Soldier Creek, Corral Creek, Wild Horse Creek, Cow Creek, Camas Creek, Dairy Creek, and McKinney Creek.
- A bacteria TMDL has been completed on Wild Horse Creek.
- Canopy cover TMDLs for temperature elevations have been completed on Willow Creek, Beaver Creek, Little Beaver Creek, Camp Creek, Soldier Creek, Corral Creek, Wild Horse Creek, and Camas Creek.
- Nutrient and/or sediment TMDLs on McKinney Creek and Dairy Creek have been completed to aid in improving the water quality of Mormon Reservoir.
- Flow alteration or lack of flow has been identified as pollution for many of the water bodies, although TMDLs are not developed for flow alteration. Water bodies listed as impacted by flow alteration include Camp Creek, Elk Creek, Soldier Creek, Corral Creek, Wild Horse Creek, Dairy Creek, Camas Creek, McKinney Creek, and Mormon Reservoir. The flow on these creeks during summer months is minimal; water usage and ground water pumping likely contributes to their dry state.
- Three of the water bodies (Willow Creek, Beaver Creek, and Little Beaver Creek) that were listed on the 303(d) list had sufficient biological data indicating that beneficial uses were fully supported. Sediment TMDLs were not completed on them as beneficial uses are fully supported. However, temperature TMDLs were completed on them as their temperature data (a numeric standard) indicates that water quality was not capable of fully supporting beneficial uses.

More detailed discussions of the data analyses are presented in the following.

Conclusions Drawn from Analysis of Biological Data

Conclusions made in relation to biological data and aquatic life beneficial uses support status for Camas Creek Subbasin are as follows:

- Biological data indicates that aquatic life beneficial uses of Willow Creek, Beaver Creek, and Little Beaver Creek are fully supported.
- Biological data indicates that aquatic life beneficial uses of McKinney Creek are not fully supported.
- Biological data on Soldier Creek, Camp Creek, and Corral Creek were not assessed because sites were located on intermittent reaches of the water bodies. There is a biological data gap on perennial segments of these water bodies.
- Biological data on Cow Creek was not assessed because the upper portion of this water body is not consistently perennial.

- Biological data on Wild Horse Creek was not assessed because the water body is an intermittent water body although there are a series of perennial beaver dam pools.
- Biological data has not been collected on Dairy Creek and should not be used to assess beneficial uses as it is an intermittent water body.
- Biological data collected on intermittent reaches of Camas Creek were not assessed, but biological data on the perennial reaches of Camas Creek indicate aquatic life beneficial uses are not fully supported.

Conclusions Drawn from Analysis of pH, DO, and Turbidity

Conclusions made in relation to water chemistry data (pH, DO, and turbidity) are as follows:

- Water chemistry data (pH, DO, and turbidity) indicated that water quality was sufficient to support beneficial uses in Soldier Creek, Willow Creek, Beaver Creek, Camp Creek, Corral Creek, Cow Creek, Wild Horse Creek, McKinney Creek, and Dairy Creek.
- Water chemistry data (pH, DO, and turbidity) were data gaps in Little Beaver Creek due to site inaccessibility and drought conditions.
- Water chemistry data (DO) indicated that water quality was not sufficient to support beneficial uses in Camas Creek.

Conclusions Drawn from Analysis of Temperature Data

Conclusions made in relation to water temperature for Cold Water Aquatic Life Uses (CWAL) and Salmonid Spawning (SS) critical periods are as follows:

- Maximum daily temperature data was elevated more than 10% of the time for CWAL critical periods on Willow Creek, Beaver Creek, Little Beaver Creek, Camp Creek, Corral Creek, Wild Horse Creek, and Camas Creek.
- Average daily temperature data was elevated more than 10% of the time for CWAL critical periods on Camp Creek, Wild Horse Creek, and Camas Creek.
- Maximum and average daily temperature data was elevated more than 10% of the time for SS critical periods on Soldier Creek, Willow Creek, Beaver Creek, Little Beaver Creek, Camp Creek, Corral Creek, and Camas Creek.
- Temperature data is a data gap for CWAL critical periods on a number of creeks due to the lack of water in the stream, these creeks include Soldier Creek, Elk Creek, Cow Creek, McKinney Creek, and Dairy Creek.
- A number of factors likely contribute to these temperature elevations, including canopy cover deficiencies resulting from land management practices, beaver dam complexes, geologic formations—such as basalt canyons that retain heat and may inhibit sufficient riparian development—flow alteration, ground water influences, and desert conditions of south central Idaho.

Conclusions Drawn from Analysis of *E. coli* Data

Conclusions made in relation to support status of the contact recreation beneficial uses based on analysis of *E. coli* data are as follows:

- Primary Contact Recreation beneficial uses are fully supported (< 406 cfu/100ml of *E. coli*)on Soldier Creek, Willow Creek, and Camas Creek.
- Secondary Contact Recreation beneficial uses are fully supported (<576 cfu/100ml of *E. coli*) on Beaver Creek, Little Beaver Creek, Camp Creek, Elk Creek, Corral Creek, Cow Creek, McKinney Creek, and Dairy Creek.
- Secondary Contact Recreation beneficial uses are not fully supported (>576 cfu/100 ml of *E. coli*) on Wild Horse Creek. Follow up samples also yielded geometric mean values (> 126 cfu/100ml of *E. coli*) that confirmed the elevation of *E. coli*.
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Conclusions Drawn from Analysis of Sediment Data

Conclusions made in relation to the impact of sediment as a pollutant on aquatic life beneficial uses are as follows:

- The average annual TSS values and daily maximum TSS values were not elevated above assessment criteria on Soldier Creek, Willow Creek, Beaver Creek, Little Beaver Creek, Camp Creek, Elk Creek, Corral Creek, Cow Creek, Wild Horse Creek, McKinney Creek, Dairy Creek, and Camas Creek.
- Percent fines data was elevated above assessment criteria on Soldier Creek, Willow Creek, Beaver Creek, Little Beaver Creek, Camp Creek, Elk Creek, Corral Creek, Cow Creek, Wild Horse Creek, McKinney Creek, Dairy Creek, and Camas Creek.
- Stream bank inventories indicate that there is an excessive source of sediment coming from the stream banks on Soldier Creek, Willow Creek, Little Beaver Creek, Camp Creek, Elk Creek, Corral Creek, Cow Creek, Wild Horse Creek, McKinney Creek, Dairy Creek, and Camas Creek.
- Stream bank inventories indicate that there is not an excessive source of sediment coming from the stream banks on Beaver Creek.

Conclusions Drawn from the Analysis of Nutrient Data

Conclusions made in relation to the impact of nutrients as a pollutant on the water bodies are as follows:

- Chlorophyll data was not elevated indicating that nuisance aquatic vegetation is not occurring in Soldier Creek, Willow Creek, Beaver Creek, Little Beaver Creek, Camp Creek, Elk Creek, Corral Creek, Cow Creek, Wild Horse Creek, McKinney Creek, Dairy Creek, and Camas Creek.
- Nuisance aquatic vegetation is not going to be a problem on most of these water bodies because there is a distinct lack of water in the water bodies during the growing season.

- Nutrients are not impairing water quality or beneficial uses in Soldier Creek, Willow Creek, Beaver Creek, Camp Creek, Elk Creek, Corral Creek, Wild Horse Creek, McKinney Creek, or Dairy Creek.
- Nutrient data is a data gap on Little Beaver Creek.
- Excessive nutrients (TP values > than the annual average of 0.50 mg/L) are being delivered to the receiving storage waters of Dairy Creek, Camas Creek, and Cow Creek.